



PSMN0R9-30YLD

N-channel 30 V, 0.87 mΩ, 300 A logic level MOSFET in LPAK56 using NextPowerS3 Technology

14 December 2015

Product data sheet

1. General description

300 Amp Logic level gate drive N-channel enhancement mode MOSFET in LPAK56 package. NextPowerS3 portfolio utilising Nexperia's unique "SchottkyPlus" technology delivers high efficiency, low spiking performance usually associated with MOSFETs with an integrated Schottky or Schottky-like diode but without problematic high leakage current. NextPowerS3 is particularly suited to high efficiency applications at high switching frequencies.

2. Features and benefits

- 300 Amp capability
- Avalanche rated, 100 % tested at $I_{AS} = 190$ Amps
- Ultra low Q_G , Q_{GD} and Q_{OSS} for high system efficiency, especially at higher switching frequencies
- Superfast switching with soft-recovery; s-factor > 1
- Low spiking and ringing for low EMI designs
- Unique "SchottkyPlus" technology; Schottky-like performance with < 1 μA leakage at 25 °C
- Optimised for 4.5 V gate drive
- Low parasitic inductance and resistance
- High reliability clip bonded and solder die attach Power SO8 package; no glue, no wire bonds, qualified to 150 °C
- Wave solderable; exposed leads for optimal visual solder inspection

3. Applications

- On-board DC-to-DC solutions for server and telecommunications
- Secondary-side synchronous rectification in telecommunication applications
- Voltage regulator modules (VRM)
- Point-of-Load (POL) modules
- Power delivery for V-core, ASIC, DDR, GPU, VGA and system components
- Brushed and brushless motor control
- Power OR-ing

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	25 °C $\leq T_j \leq$ 150 °C	-	-	30	V

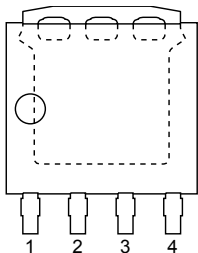
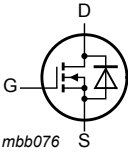
N-channel 30 V, 0.87 mΩ, 300 A logic level MOSFET in LPAK56 using NextPowerS3 Technology

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I _D	drain current	T _{mb} = 25 °C; V _{GS} = 10 V; Fig. 2	[1]	-	-	300	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 1		-	-	291	W
T _j	junction temperature			-55	-	150	°C
Static characteristics							
R _{DSon}	drain-source on-state resistance	V _{GS} = 4.5 V; I _D = 25 A; T _j = 25 °C; Fig. 10		-	0.79	1.09	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; Fig. 10		-	0.65	0.87	mΩ
Dynamic characteristics							
Q _{GD}	gate-drain charge	V _{GS} = 4.5 V; I _D = 25 A; V _{DS} = 15 V; Fig. 12 ; Fig. 13		-	13.5	-	nC
Q _{G(tot)}	total gate charge	V _{GS} = 10 V; I _D = 25 A; V _{DS} = 15 V; Fig. 12 ; Fig. 13		-	109	-	nC
Source-drain diode							
S	softness factor	I _S = 25 A; V _{GS} = 0 V; dI _S /dt = -100 A/μs; V _{DS} = 15 V; Fig. 16		-	0.9	-	

[1] 300A Continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, Thermal design and operating temperature.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 LPAK56; Power-SO8 (SOT1023)	 mbb076
2	S	source		
3	S	source		
4	G	gate		
mb	D	mounting base; connected to drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN0R9-30YLD	LPAK56; Power-SO8	Plastic single-ended surface-mounted package (LPAK56); 4 leads	SOT1023

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN0R9-30YLD	0D930L

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$25\text{ °C} \leq T_J \leq 150\text{ °C}$		-	30	V
V_{DGR}	drain-gate voltage	$25\text{ °C} \leq T_J \leq 150\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$		-	30	V
V_{GS}	gate-source voltage			-20	20	V
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; Fig. 1		-	291	W
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 2	[1]	-	300	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; Fig. 2		-	284	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$; Fig. 3		-	1800	A
T_{stg}	storage temperature			-55	150	°C
T_J	junction temperature			-55	150	°C
$T_{sld(M)}$	peak soldering temperature			-	260	°C
V_{ESD}	electrostatic discharge voltage	HBM		2000	-	V
Source-drain diode						
I_S	source current	$T_{mb} = 25\text{ °C}$		-	242	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$		-	1800	A
Avalanche ruggedness						
I_{AS}	non-repetitive avalanche current	$V_{sup} \leq 30\text{ V}$; $V_{GS} = 10\text{ V}$; $T_{J(init)} = 25\text{ °C}$; $R_{GS} = 50\text{ }\Omega$	[2]	-	190	A
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{J(init)} = 25\text{ °C}$; $I_D = 25\text{ A}$; $V_{sup} \leq 30\text{ V}$; $R_{GS} = 50\text{ }\Omega$; unclamped; $t_p = 6.1\text{ ms}$	[2]	-	2987	mJ

[1] 300A Continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, Thermal design and operating temperature.

[2] Protected by 100% test

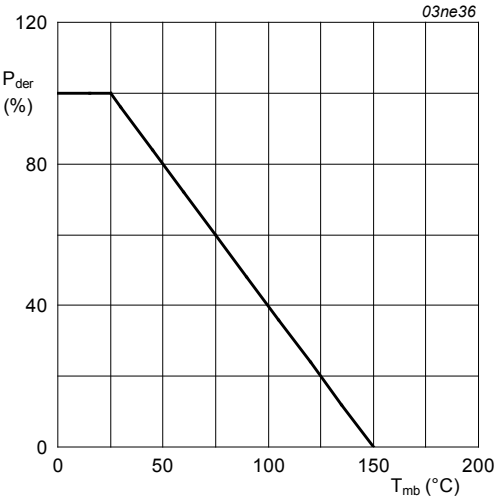
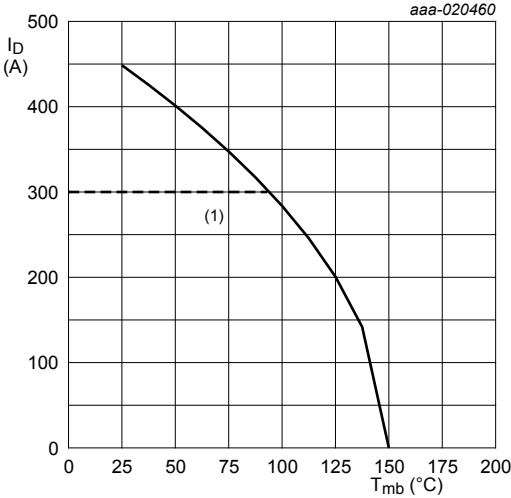


Fig. 1. Normalized total power dissipation as a function of mounting base temperature

$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$



(1) 300A continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, Thermal design and operating temperature

Fig. 2. Continuous drain current as a function of mounting base temperature

$$V_{GS} \geq 10V$$

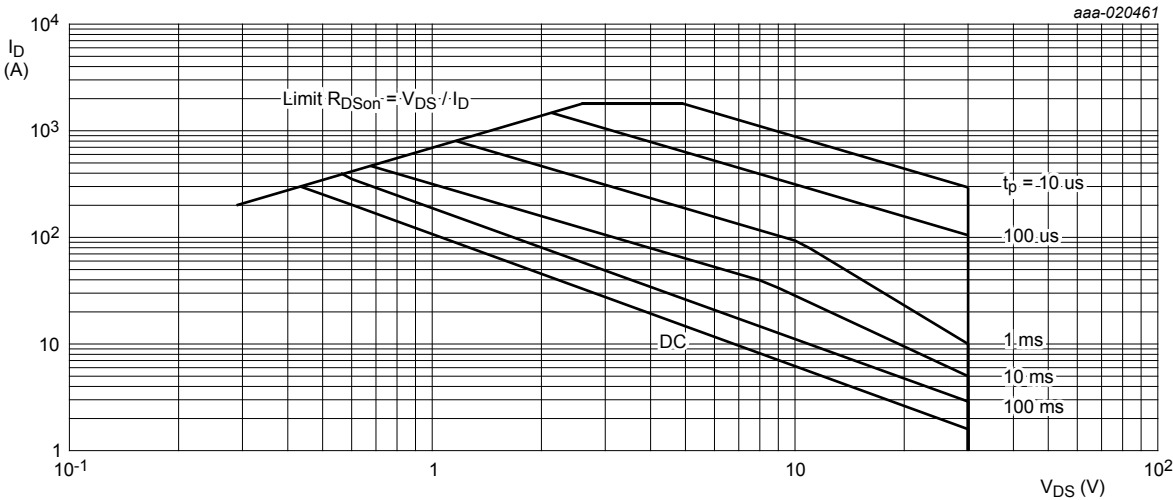


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$$T_{mb} = 25^{\circ}C; I_{DM} \text{ is a single pulse}$$

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 4	-	0.35	0.43	K/W

N-channel 30 V, 0.87 mΩ, 300 A logic level MOSFET in LPAK56 using NextPowerS3 Technology

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R _{th(j-a)}	thermal resistance from junction to ambient	Fig. 5	-	50	-	K/W
		Fig. 6	-	125	-	K/W

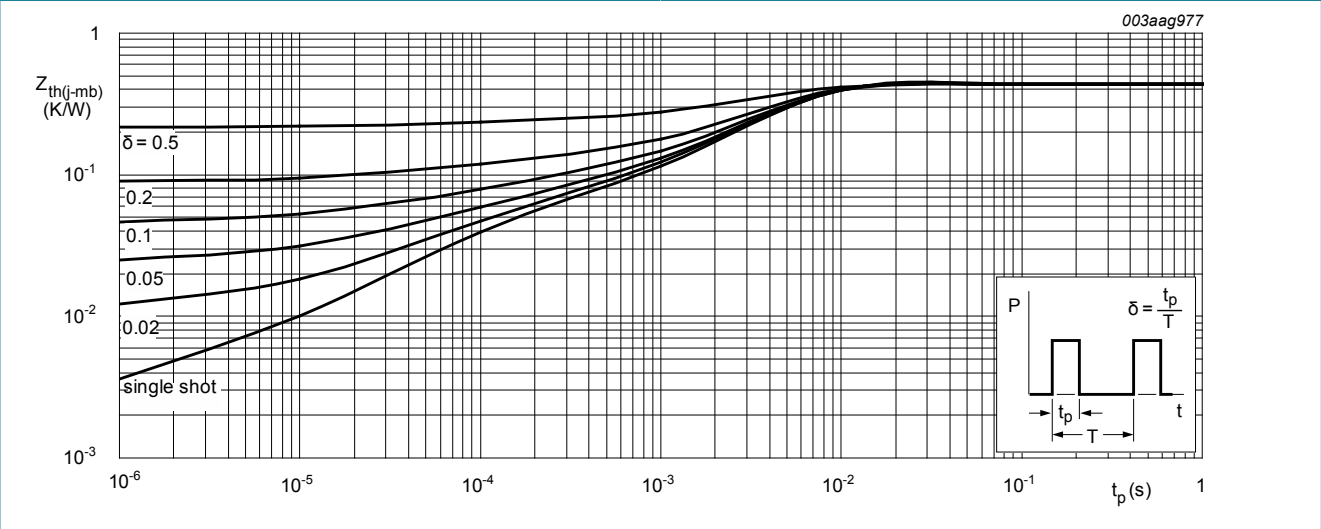


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

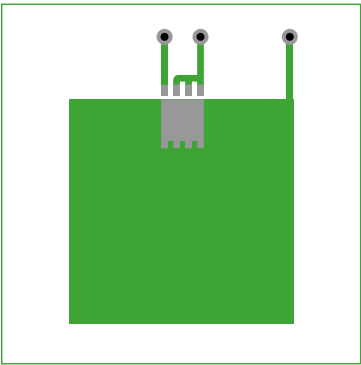


Fig. 5. PCB layout for thermal resistance junction to ambient 1" square pad; FR4 Board; 2oz copper

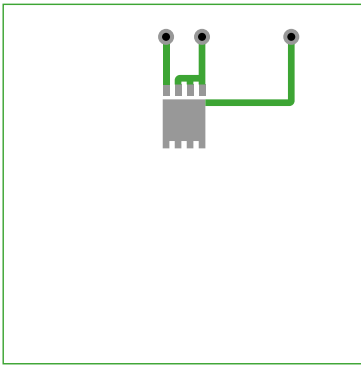


Fig. 6. PCB layout for thermal resistance junction to ambient minimum footprint; FR4 Board; 2oz copper

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _J = 25 °C	30	-	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _J = -55 °C	27	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _J = 25 °C	1.2	1.5	2.2	V

**N-channel 30 V, 0.87 mΩ, 300 A logic level MOSFET in LPAK56 using
NextPowerS3 Technology**

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	$25\text{ °C} \leq T_J \leq 150\text{ °C}$		-	-4.5	-	mV/K
I_{DSS}	drain leakage current	$V_{DS} = 24\text{ V}; V_{GS} = 0\text{ V}; T_J = 25\text{ °C}$		-	-	1	μA
		$V_{DS} = 24\text{ V}; V_{GS} = 0\text{ V}; T_J = 125\text{ °C}$		-	3.7	-	μA
I_{GSS}	gate leakage current	$V_{GS} = 16\text{ V}; V_{DS} = 0\text{ V}; T_J = 25\text{ °C}$		-	-	100	nA
		$V_{GS} = -16\text{ V}; V_{DS} = 0\text{ V}; T_J = 25\text{ °C}$		-	-	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 25\text{ A}; T_J = 25\text{ °C};$ Fig. 10		-	0.79	1.09	mΩ
		$V_{GS} = 4.5\text{ V}; I_D = 25\text{ A}; T_J = 150\text{ °C};$ Fig. 10; Fig. 11		-	-	1.8	mΩ
		$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_J = 25\text{ °C};$ Fig. 10		-	0.65	0.87	mΩ
		$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_J = 150\text{ °C};$ Fig. 10; Fig. 11		-	-	1.44	mΩ
R_G	internal gate resistance (AC)	$f = 1\text{ MHz}$		-	1.4	-	Ω

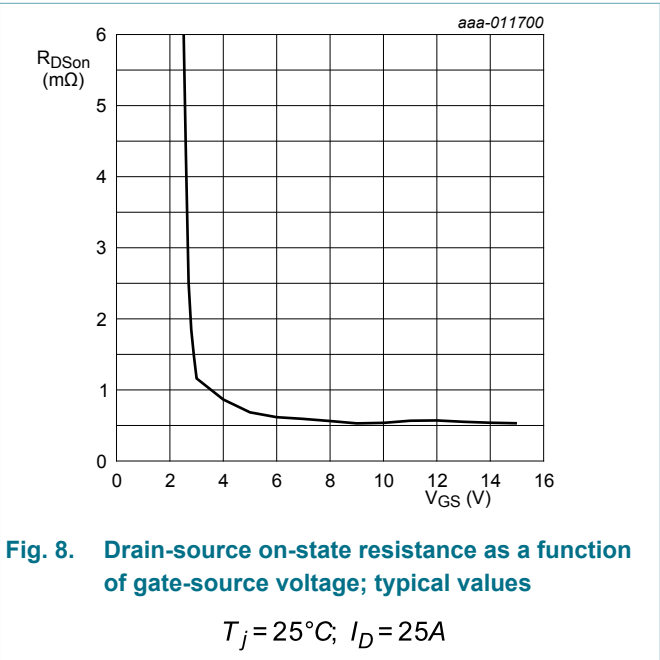
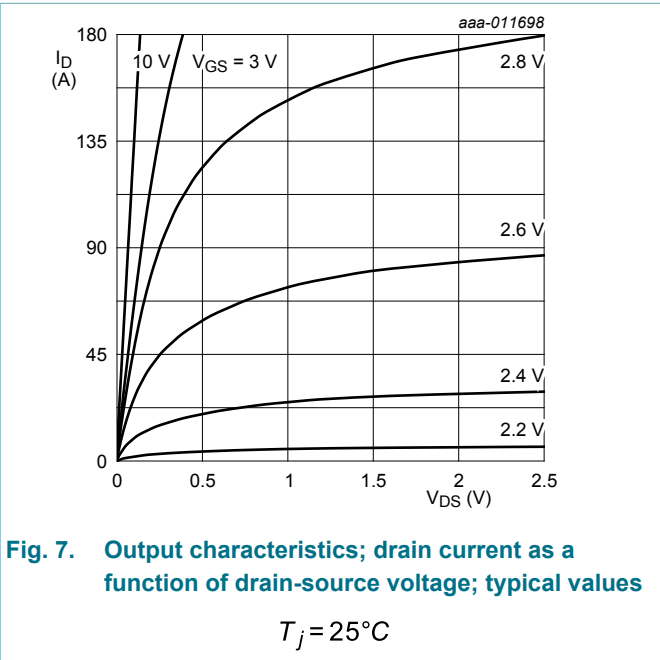
Dynamic characteristics

$Q_{G(tot)}$	total gate charge	$I_D = 25\text{ A}; V_{DS} = 15\text{ V}; V_{GS} = 10\text{ V};$ Fig. 12; Fig. 13		-	109	-	nC
		$I_D = 25\text{ A}; V_{DS} = 15\text{ V}; V_{GS} = 4.5\text{ V};$ Fig. 12; Fig. 13		-	51	-	nC
		$I_D = 0\text{ A}; V_{DS} = 0\text{ V}; V_{GS} = 0\text{ V}$		-	99	-	nC
Q_{GS}	gate-source charge	$I_D = 25\text{ A}; V_{DS} = 15\text{ V}; V_{GS} = 4.5\text{ V};$ Fig. 12; Fig. 13		-	15.3	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge			-	10.5	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge			-	4.8	-	nC
Q_{GD}	gate-drain charge			-	13.5	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25\text{ A}; V_{DS} = 15\text{ V};$ Fig. 12; Fig. 13		-	2.4	-	V
C_{iss}	input capacitance	$V_{DS} = 15\text{ V}; V_{GS} = 0\text{ V}; f = 1\text{ MHz};$ $T_J = 25\text{ °C};$ Fig. 14		-	7668	-	pF
C_{oss}	output capacitance			-	2914	-	pF
C_{rss}	reverse transfer capacitance			-	445	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 15\text{ V}; R_L = 0.6\text{ Ω}; V_{GS} = 4.5\text{ V};$ $R_{G(ext)} = 5\text{ Ω}$		-	38.1	-	ns
t_r	rise time			-	49.8	-	ns
$t_{d(off)}$	turn-off delay time			-	63	-	ns
t_f	fall time			-	42.6	-	ns

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Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Q_{oss}	output charge	$V_{GS} = 0\text{ V}$; $V_{DS} = 15\text{ V}$; $f = 1\text{ MHz}$; $T_{mb} = 25\text{ °C}$		-	83.11	-	nC
Source-drain diode							
V_{SD}	source-drain voltage	$I_S = 25\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ °C}$; Fig. 15		-	0.76	1.2	V
t_{rr}	reverse recovery time	$I_S = 25\text{ A}$; $dI_S/dt = -100\text{ A/}\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 15\text{ V}$; Fig. 16		-	52	-	ns
Q_r	recovered charge		[1]	-	67	-	nC
t_a	reverse recovery rise time			-	27.4	-	ns
t_b	reverse recovery fall time			-	24.7	-	ns
S	softness factor			-	0.9	-	

[1] includes capacitive recovery



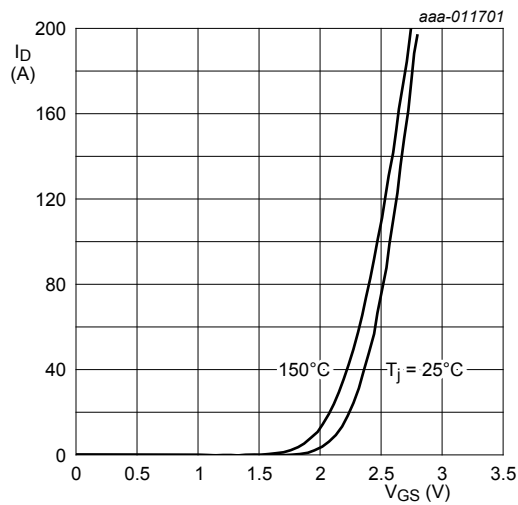


Fig. 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values

$$V_{DS} = 12V$$

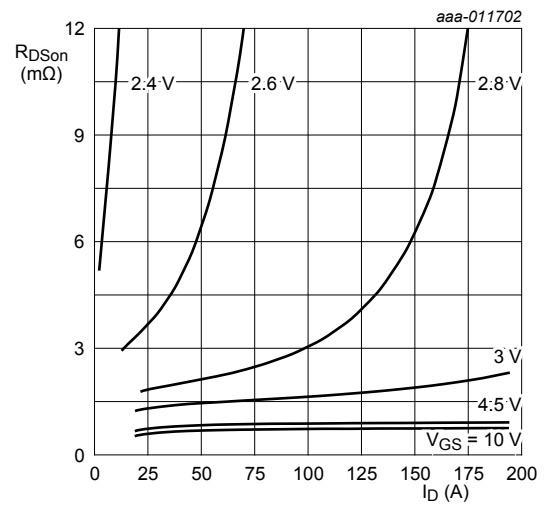


Fig. 10. Drain-source on-state resistance as a function of drain current; typical values

$$T_j = 25^\circ\text{C}$$

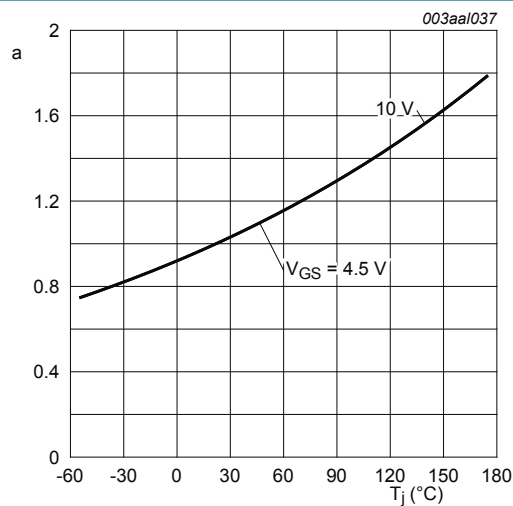


Fig. 11. Normalized drain-source on-state resistance factor as a function of junction temperature

$$a = \frac{R_{DSon}}{R_{DSon}(25^{\circ}\text{C})}$$

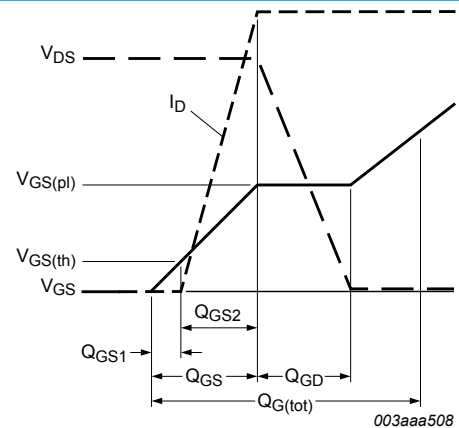


Fig. 12. MOSFET transistor: Gate charge waveform definitions

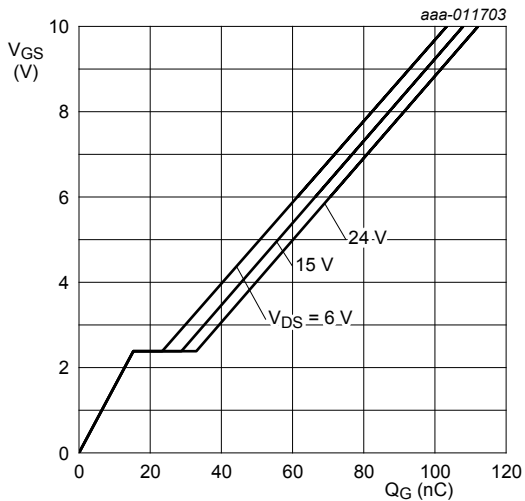


Fig. 13. Gate-source voltage as a function of gate charge; typical values

$T_j = 25^{\circ}\text{C}; I_D = 25\text{A}$

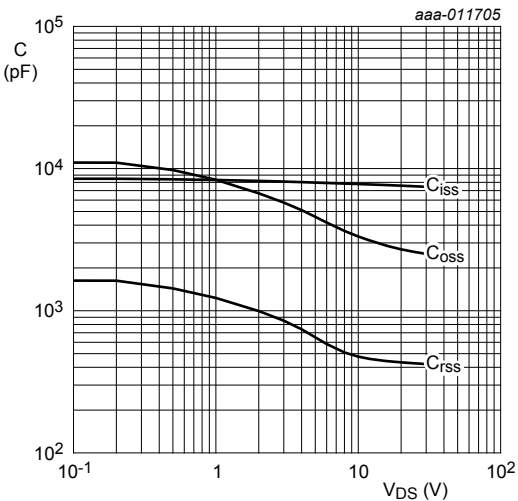


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

$V_{GS} = 0\text{V}; f = 1\text{MHz}$

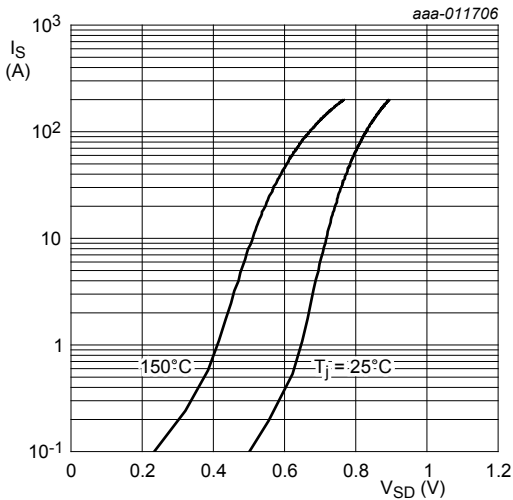


Fig. 15. Source current as a function of source-drain voltage; typical values

$V_{GS} = 0\text{V}$

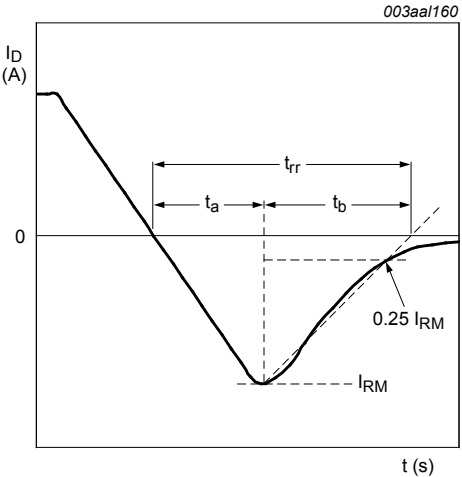


Fig. 16. Reverse recovery timing definition

11. Package outline

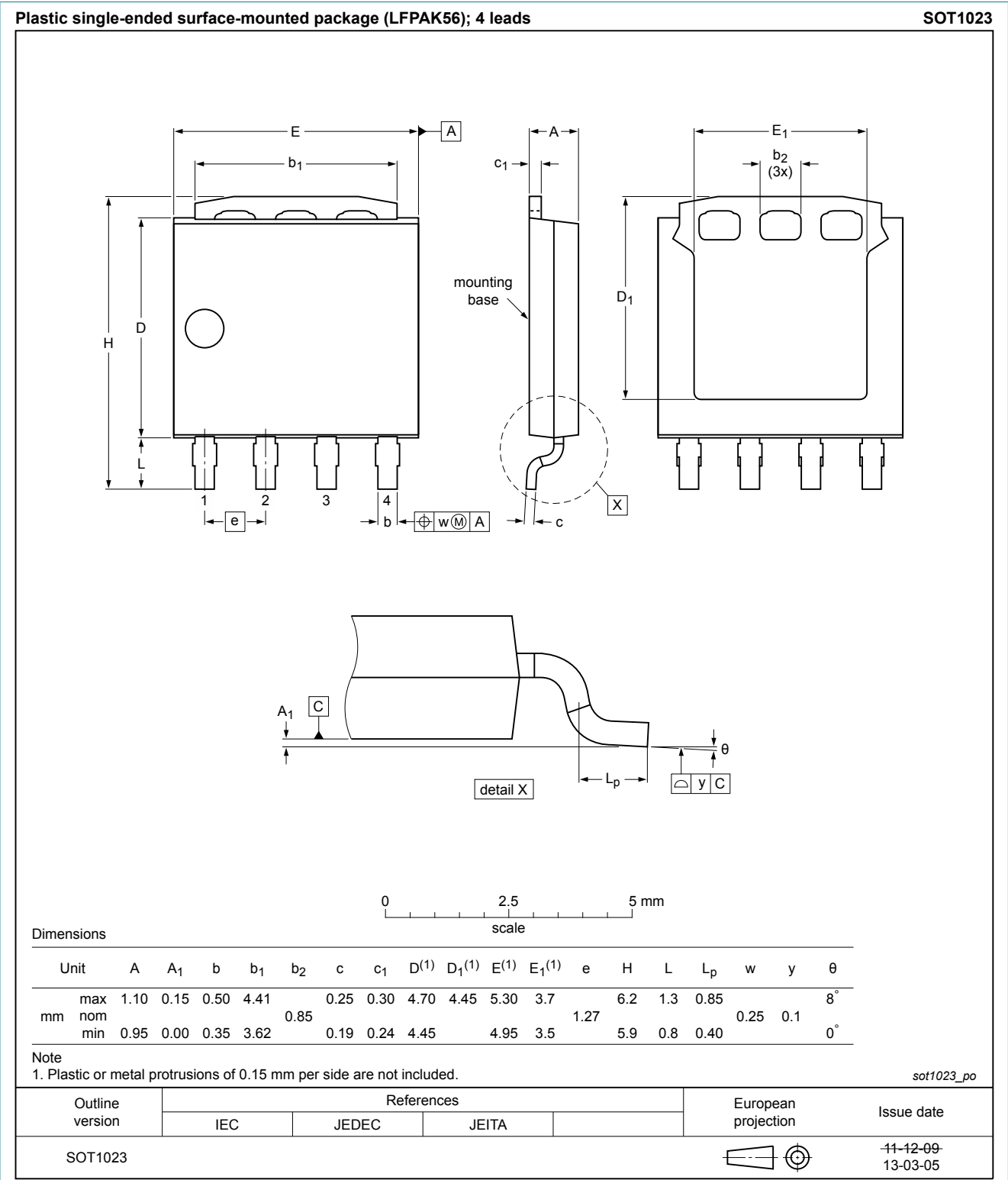


Fig. 17. Package outline LPAK56; Power-SO8 (SOT1023)

12. Legal information

12.1 Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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13. Contents

1 General description 1

2 Features and benefits 1

3 Applications 1

4 Quick reference data 1

5 Pinning information 2

6 Ordering information 2

7 Marking 3

8 Limiting values 3

9 Thermal characteristics 4

10 Characteristics 5

11 Package outline 10

12 Legal information 11

12.1 Data sheet status 11

12.2 Definitions 11

12.3 Disclaimers 11

12.4 Trademarks 12

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<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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